

POLARIZATION FIELD ENHANCED TUNNEL STRUCTURES

ABSTRACT

A novel tunnel structure is described that enables tunnel diode behavior to be exhibited even in material systems in which extremely heavy doping is impossible and only moderate or light doping levels may be achieved. In one aspect, the tunnel heterostructure includes a first semiconductor layer, a second semiconductor layer, and an intermediate semiconductor layer that is sandwiched between the first and second semiconductor layers and forms first and second heterointerfaces respectively therewith. The first and second heterointerfaces are characterized by respective polarization charge regions that produce a polarization field across the intermediate semiconductor layer that promotes charge carrier tunneling through the intermediate semiconductor layer. In another aspect, the invention features a semiconductor structure having a p-type region, and the above-described heterostructure disposed as a tunnel contact between the p-type region of the semiconductor structure and an adjacent n-type region.